Student Learning: Condensation

A group of fourth-graders had glasses of cold water and ice cubes. The students noticed that the glasses were wet on the outside, apparently covered with water, and they wondered where the water came from. In searching for an explanation of where the water on the outside of the glass came from, they called on their previous experience of water leaking out of containers such as paper cups.

Based on those experiences, they reasoned that the water somehow leaked out of the glass. They told their teacher about their idea, and she asked them how they could test the idea. They said that if the water came from inside the glass, then the glass should end up with less water in it. One student said that they could mark the water level on the glass and see if the water level went down after a while. The teacher suggested that they cover the glass so water wouldn't evaporate out of it.

So the students tested their idea by covering a glass of water with plastic wrap, marking the water level, letting it sit for 30 minutes, and checking to see if the water level had gone down. They found that the water level did not change.

This test challenged their explanation, so they turned to yet another idea from their previous experience. They recalled that on cold days, sometimes their parents' car windows had dew on them. They wondered if it was the cold that caused the water on the outside of the glass and tentatively posed this as an explanation. They decided to test this idea by putting ice water in one glass and warm water in another to see if there was a difference. They reasoned that if the glass of ice water had water on the outside but the glass of warm water did not, then it must be the cold that caused it.

The students tested their idea by putting ice water in one glass, warm water in a second glass, and checking to see if there was water on the outside of either glass. They found that there was a film of water on the outside of the glass filled with ice water but no water on the outside of the glass filled with warm water.

This test supported their explanation. They concluded that it was the cold and not the water in the glass that caused the thin film of water on the outside of the glass.

Note: *This anecdote is a fictional account written for the purposes of illustrating the science process skills in action.*

The science in this anecdote: The film of water on the outside of the cold glass is caused by condensation. Condensation is the change of state from vapor to liquid. There is water vapor in the air that comes into contact with the cold surface of the glass. All air has water vapor (the gaseous state of water) in it, sometimes more and sometimes less. The degree of water in the air is called humidity. Locales with high humidity have a relatively high degree of water vapor in the air. The amount of water vapor that the air is capable of holding depends on the temperature. The colder the air, the less water vapor it can hold. If the air is cooled to a point where it can't hold the water vapor that is already in it, some of that water vapor condenses into liquid water. In our example, the cold surface of the glass cools the adjacent air enough to cause water vapor to condense from the air onto the outside surface of the glass.